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# CLAIMS

1. An apparatus for launching balls for sports practice comprising:
  - a tank (2) for housing a gaseous fluid under pressure;
  - a launch tube (3) whose section substantially corresponds to that of a ball (4) to be launched, said tube having an open end (7) for launching the ball (4) and having a seat (8) for positioning the ball (4);
  - an exhaust duct (5) of the fluid operatively connected between said tank (2) and said launch tube (3); and
  - a rapid opening device (6) for discharging on command said fluid from said tank (2) to said launch tube (3) through said exhaust duct (5), to cause the launching of the ball (4); **and**
  - ~~characterised in that it further comprises throttling means (37) mounted in said exhaust duct (5) to cause the transfer of the fluid from the tank (2) to launch tube (3);~~
  - characterised in that said throttling means are adapted to be adjusted for varying the effective section of the exhaust duct such that said effective section determined by the throttling means remains the same during a whole launch.**
- ~~2. An apparatus as claimed in claim 1 characterised in that said throttling means (37) allow to regulate the transfer of the fluid from the tank (2) to the launch tube (3).~~
- 3 2. An apparatus as claimed in claim 1 ~~or 2~~ characterised in that said throttling means (37) comprise a fixed part (38) and a movable part (39) relative to the fixed part (38), the displacement of said movable part (39) relative to said fixed part (38) determining a variation in the effective section of the exhaust duct (5) in correspondence with the throttling means (37).
- 4 3. An apparatus as claimed in claim 3 2 characterised in that said movable part (39) is constituted by a bulb obturator.
- 5 4. An apparatus as claimed in claim 3 2 characterised in that said movable part (39) is constituted by a sleeve whose outer wall (40) slides in proximity to the fixed part (38) and which has a narrowing (41) in corresponding with its own inlet section for the fluid, and one or more slits (42) extending astride the fixed part.
- 6 5. An apparatus as claimed in claim 1 ~~or 2~~ characterised in that said throttling means (37) comprise one or more interchangeable ring nuts (61), each ring nut (61) defining a different throttling

of the fluid transit section in the exhaust duct (5).

**7 6.** An apparatus as claimed in any of the previous claims, characterised in that said quick opening device (6) comprises at least a main valve (9) with rapid opening which controls the discharge of the fluid from the tank (2) to the exhaust duct (5).

**8 7.** An apparatus as claimed in claim **7 6** characterised in that said quick opening device (6) further comprises at least an actuation valve (11) which determines the actuation of the main valve (9).

**9 8.** An apparatus as claimed in claim **8 7** characterised in that said quick opening device (6) further comprises at least a control valve (10) which drives the opening of the main valve (9) and is in turn controlled by the actuation valve (11).

~~10 9.~~ An apparatus as claimed in claim ~~8 or 9~~ **7 or 8** characterised in that said main valve (9) comprises a first movable obturator (12) actuated by means of a pressurisable first chamber (13), said first obturator (12) being in the closed position when said first chamber (13) is pressurised and going to the open position when the first chamber (13) is depressurised, said control valve (10) causing, when it is opened, the depressurisation of the first chamber (13).

~~11 10.~~ An apparatus as claimed in claims ~~9 and 10~~ **8 and 9** characterised in that said control valve (10) comprises a second movable obturator (14) actuated by means of a second pressurisable chamber (15), said second obturator (14) being in the closed position when said second chamber (15) is pressurised and going in the open position when the second chamber (15) is depressurised, said actuating valve (11) causing, when it is opened, the depressurisation of the second chamber (15).

~~12 11.~~ An apparatus as claimed in claim ~~8, 9, 10 or 11~~ **7, 8, 9 or 10**, characterised in that said actuating valve (11) is a solenoid valve.

~~13 12.~~ An apparatus as claimed in claim ~~8, 9, 10, 11 or 12~~ **7, 8, 9, 10 or 11** characterised in that said actuating valve (11) is remotely controllable.

~~14 13.~~ An apparatus as claimed in claim ~~8, 9, 10, 11 or 12~~ **7, 8, 9, 10 or 11** characterised in that said actuating valve (11) is a manual valve.

~~15 14.~~ An apparatus as claimed in claim ~~8, 9, 10, 11 or 12~~ **7, 8, 9, 10 or 11** characterised in that it comprises two parallel actuating valves (11), a manually operated valve and a solenoid valve.

~~16 15.~~ An apparatus as claimed in claim ~~10 9~~ characterised in that said throttling means (37) allow

to vary the fluid passage section in the main valve (9), acting on the travel of the first obturator (12).

~~17~~ 16. An apparatus as claimed in claim ~~16~~ 15 characterised in that said throttling means (37) comprise one or more interchangeable inserts (62) able to be inserted into the first chamber (13) to vary the travel of the first obturator (12).

~~18~~ 17. An apparatus as claimed in claim ~~16~~ 15 characterised in that said throttling means (37) allow the inner part (63) of the exhaust duct (5), against whose end (64) bears in closure the first obturator (12), to be adjustable axially.

~~19~~ 18. An apparatus as claimed in any of the previous claims, characterised in that it further comprises a circuit (20) for pressurising said tank (2).

~~20~~ 19. An apparatus as claimed in claim ~~10 and 19~~ 9 and 18 characterised in that said pressurisation circuit (20) also pressurises said first chamber (13), the tank (2) and the first chamber (13) being in fluid communication.

~~21~~ 20. An apparatus as claimed in claim ~~11 and 19~~ 10 and 18 characterised in that said pressurisation circuit (20) also pressurises said second chamber (15), the tank (2) and the second chamber (15) being in fluid communication.

~~22~~ 21. An apparatus as claimed in claim ~~19, 20 or 21~~ 18, 19 or 20 characterised in that said pressurisation circuit (20) allows the automatic recharging of the tank (2) after each launch.

~~23~~ 22. An apparatus as claimed in any of the previous claims, characterised in that it further comprises means (43) for varying the position of said seat (8) for the ball (4) to be launched in said launch tube (3).

~~24~~ 23. An apparatus as claimed in claim ~~23~~ 22 characterised in that said throttling means (37) and said means (43) for varying the position of the seat (8) for the ball (4) are operatively associated to vary the position of the seat (8) according to the regulation of the transfer of the fluid from tank (2) to the launch tube (3) and vice versa, according to a predetermined relationship.

~~25~~ 24. An apparatus as claimed in claims ~~3 and 24~~ 2 and 23 characterised in that said seat (8) for the ball (4) to be launched is rigidly connected to the mobile part (39) of the adjustment means, the displacement of the movable part (39) causing a corresponding displacement of the seat (8) for the ball (4) to be launched within the launch tube (3).

~~26~~ 25. An apparatus as claimed in claims ~~6 and 24~~ 5 and 23 characterised in that each

interchangeable ring nut (61) also determines a different positioning of the seat (8) for the ball (4) within the launch tube (3).

**27 26.** An apparatus as claimed in any of the previous claims, characterised in that between the seat (8) for the ball (4) and the end of the launch tube (3) opposite the open end (7) is also identified, when the ball (4) is in the seat (8), a third chamber (45) in which the fluid expands at the moment of the launch, and in that said exhaust duct (5) is connected to the launch tube (3) in correspondence with the seat (8) for the ball (4).

**28 27.** An apparatus as claimed in any of the previous claims, characterised in that the tank (2) has variable volume.

**29 28.** An apparatus as claimed in any of the previous claims, characterised in that it further comprises means for enhancing launch precision (67).

**30 29.** An apparatus as claimed in claim ~~29~~ **28** characterised in that said means for enhancing launch precision (67) are constituted by an annular element (69) positioned at an appropriate distance from the open end (7) of the launch tube (3).

**34 30.** An apparatus as claimed in claim ~~30~~ **29** characterised in that the annular element (69) has a slightly greater inner diameter than the inner diameter of the launch tube (3).

**32 31.** An apparatus as claimed in any of the previous claims, characterised in that it further comprises launch noise reducing means (68).

**33 32.** An apparatus as claimed in claim ~~32~~ **31** characterised in that the noise reducing means (68) are constituted by an annular chamber (71), of adequate volume, mounted coaxially to the launch tube (3), and having an inner slit (72) obtained in correspondence with the open end (7) of the launch tube (3), and a plurality of lateral slits (73).

**34 33.** An apparatus as claimed in claim ~~33~~ **32** characterised in that the total passage section in said annular chamber (71) is not much smaller than the section of the launch tube (3).

**35 34.** An apparatus as claimed in claim ~~33 or 34~~ **32 or 33** characterised in that the inner surfaces of the annular chamber (71) are coated with sound absorbing material.

**36 35.** An apparatus as claimed in any of the previous claims, characterised in that said fluid is air.

**37 36.** An apparatus as claimed in any of the previous claims, characterised in that it further comprises a support structure which allows to adjust the orientation of the launch tube (3).

~~38~~ 37. An apparatus as claimed in any of the previous claims, characterised in that it further comprises a programmable electronic unit which can enable its automated and remotely controlled operation.

~~39~~ 38. An apparatus as claimed in any of the previous claims, characterised in that the exhaust duct (5) has a smaller section than the launch tube (3).